

**North Carolina Pedestrian Crash Types
2005-2009**

**Prepared for
The North Carolina Department of Transportation
Division of Bicycle and Pedestrian Transportation**

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Background

A total of 12,419 collisions between motor vehicles and pedestrians were reported in North Carolina over the five year period of 2005 to 2009. On average, 168 pedestrians were killed and another 200 were reported seriously injured in collisions each year.¹

The information from the state crash report forms is stored in electronic files. Analysis of these data can provide information on *where* pedestrian-motor vehicle crashes occur (city street, two-lane roadway, intersection location, etc.), *when* they occur (time of day, day of week, etc.), and *to whom* they occur (age of victim, gender, level of impairment, etc.), but can provide very little information about the actual sequence of events leading to the crash. The development of effective countermeasures to help prevent crashes and reduce the severity of these crashes is hindered by insufficient detail about the events of pedestrian-related crashes in typical electronic crash databases.

To address this situation, the National Highway Traffic Safety Administration (NHTSA) developed a system of “typing” pedestrian and bicycle crashes. Each identified crash type is defined by a specific sequence of events, and each has precipitating actions, predisposing factors, and characteristic populations and/or locations that can be targeted for interventions. The original pedestrian crash typology was developed and applied during the early 1970’s (Snyder and Knoblauch, 1971; Knoblauch, 1977; Knoblauch, Moore and Schmitz, 1978). Cross and Fisher (1977) later developed a similar typology for bicycle crashes. Harkey, Mekemson, Chen, and Krull (2000) created the Pedestrian and Bicycle Crash Analysis Tool (PBCAT), interactive software that enables both pedestrian and bicycle crashes to be easily and quickly typed by answering a series of on-screen questions. [PBCAT](http://www.walkinginfo.org/pc/pbcats.htm) version 2 was released in 2006 and is available for free download (Harkey, Tsai, Thomas, and Hunter, 2006). For more information on PBCAT and crash typing, including detailed descriptions and images of typical crash scenarios, see: <http://www.walkinginfo.org/pc/pbcats.htm>

This report summarizes pedestrian-motor vehicle crash types that have been coded for five years of North Carolina police-reported data. UNC Highway Safety Research Center staff used PBCAT software to add a specific crash type, and information on where the crash occurred and the pedestrian’s position prior to the crash, to the data for each pedestrian-motor vehicle crash for which a standard police report form was available. For more information on trends in NC pedestrian crashes, see the **Pedestrian Crash Facts** summary report.

¹ The number of pedestrians killed and injured reflects only the “first” pedestrian reported on in the crash. A few crashes each year involve multiple pedestrians, and may include multiple injuries and fatalities. For example, in 2007, one collision resulted in 8 pedestrian fatalities. These circumstances are relatively rare, however, and in order not to over-represent the number of crashes, the data contained in this report account for only the first pedestrian, who was also verified as a pedestrian during review of the crash reports.

Results

Individual Crash Types

Table 1 shows the number of each of 60 different individual crash types per year and in total for the years 2005 – 2009, as developed by using PBCAT software to code the five years of crash data from copies of crash report forms. All of the 12,419 reported pedestrian-motor vehicle crashes were assigned crash types using the PBCAT software. Table 1 shows the many ways pedestrian-motor vehicle crashes can occur, including backing vehicles in parking lots, pedestrian failure to yield and dashes, walking along the roadway, turning vehicles, etc. (Note that updated crash typing software was used beginning in 2006. A few crash type definitions changed and so some types were not applicable either before 2006, or for 2006 and later years.)

There is some year-to-year variability in the frequencies and proportions of each crash type, especially those with smaller numbers. Much of this variation is likely explained by chance. There was, however, a fairly substantial drop between 2008 to 2009 in the number and proportion of **Walking Along Roadway With Traffic - From Behind** type of crash, for example, while the numbers of **Motor Vehicle Loss of Control** showed an increase. The latter type involves motorists losing control due to drugs/ alcohol, surface irregularities or other factors and may include a road departure that results in a pedestrian walking along the roadway being struck. In the past two years, more crashes of this type have been coded that may formerly have been coded as **Walking Along Roadway with Traffic – From Behind**. Reasons for the drop in the first type aren't known, but could be related to such changes in coding, as well as less frequent walking along NC roadways in the same direction as traffic, chance variation, or, most likely, to a combination of these factors. But, in general, the most frequent crash types tend to appear in fairly consistent proportions across years, although numbers may gradually decline or increase.

Table 1. Individual NC pedestrian crash types by year. ¹

| Crash Type | 2005 | 2006 | 2007 | 2008 | 2009 | Total |
|-------------------------------|------------------|------|------|------|------|------------------|
| Assault with Vehicle | 39 | 50 | 60 | 17 | 30 | 196 |
| | 1.6 ² | 2 | 2.3 | 0.7 | 1.2 | 1.6 ³ |
| Dispute-Related | 101 | 106 | 85 | 70 | 55 | 417 |
| | 4.2 | 4.3 | 3.3 | 2.8 | 2.3 | 3.4 |
| Pedestrian on Vehicle | 75 | 64 | 50 | 39 | 51 | 279 |
| | 3.1 | 2.6 | 2 | 1.5 | 2.1 | 2.2 |
| Vehicle-Vehicle / Object | 171 | 120 | 105 | 80 | 74 | 550 |
| | 7.1 | 4.8 | 4.1 | 3.2 | 3 | 4.4 |
| Motor Vehicle Loss of Control | n-a | 34 | 71 | 111 | 107 | 323 |
| | | 1.4 | 2.8 | 4.4 | 4.4 | 2.6 |
| Pedestrian Loss of Control | n-a | 22 | 34 | 29 | 22 | 107 |
| | | 0.9 | 1.3 | 1.2 | 0.9 | 0.9 |
| Other Unusual | 17 | 14 | 9 | 49 | 14 | 103 |

| Crash Type | 2005 | 2006 | 2007 | 2008 | 2009 | Total |
|---|------|------|------|------|------|-------|
| Circumstances | 0.7 | 0.6 | 0.4 | 1.9 | 0.6 | 0.8 |
| Backing Vehicle - Driveway | 25 | 24 | 34 | 31 | 28 | 142 |
| | 1 | 1 | 1.3 | 1.2 | 1.2 | 1.1 |
| Backing Vehicle - Driveway / Sidewalk Intersection | 9 | 5 | 8 | 7 | 5 | 34 |
| | 0.4 | 0.2 | 0.3 | 0.3 | 0.2 | 0.3 |
| Backing Vehicle - Roadway | 34 | 38 | 44 | 37 | 28 | 181 |
| | 1.4 | 1.5 | 1.7 | 1.5 | 1.2 | 1.5 |
| Backing Vehicle - Parking Lot | 154 | 174 | 160 | 175 | 198 | 861 |
| | 6.4 | 7 | 6.3 | 6.9 | 8.2 | 6.9 |
| Backing Vehicle - Other / Unknown | 15 | 15 | 12 | 24 | 23 | 89 |
| | 0.6 | 0.6 | 0.5 | 1 | 0.9 | 0.7 |
| Driverless Vehicle | 22 | 31 | 62 | 53 | 41 | 209 |
| | 0.9 | 1.2 | 2.4 | 2.1 | 1.7 | 1.7 |
| Disabled Vehicle-Related | 25 | 31 | 34 | 37 | 40 | 167 |
| | 1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.3 |
| Emergency Vehicle-Related | 7 | 6 | 9 | 15 | 10 | 47 |
| | 0.3 | 0.2 | 0.4 | 0.6 | 0.4 | 0.4 |
| Play Vehicle-Related | 18 | 25 | 24 | 25 | 21 | 113 |
| | 0.7 | 1 | 0.9 | 1 | 0.9 | 0.9 |
| Working in Roadway | 23 | 30 | 20 | 29 | 35 | 137 |
| | 1 | 1.2 | 0.8 | 1.2 | 1.4 | 1.1 |
| Playing in Roadway | 5 | 0 | 5 | 4 | 1 | 15 |
| | 0.2 | 0 | 0.2 | 0.2 | 0 | 0.1 |
| Lying in Roadway | 17 | 17 | 23 | 17 | 17 | 91 |
| | 0.7 | 0.7 | 0.9 | 0.7 | 0.7 | 0.7 |
| Entering / Exiting Parked Vehicle | 2 | 10 | 7 | 3 | 5 | 27 |
| | 0.1 | 0.4 | 0.3 | 0.1 | 0.2 | 0.2 |
| Mailbox-Related | 12 | 7 | 12 | 7 | 8 | 46 |
| | 0.5 | 0.3 | 0.5 | 0.3 | 0.3 | 0.4 |
| Commercial Bus-Related | 8 | 12 | 9 | 9 | 11 | 49 |
| | 0.3 | 0.5 | 0.4 | 0.4 | 0.5 | 0.4 |
| School Bus-Related | 12 | 25 | 16 | 8 | 17 | 78 |
| | 0.5 | 1 | 0.6 | 0.3 | 0.7 | 0.6 |
| Ice Cream / Vendor Truck-Related | 3 | 4 | 5 | 5 | 4 | 21 |
| | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Walking Along Roadway With Traffic - From Behind | 181 | 157 | 174 | 205 | 117 | 834 |
| | 7.5 | 6.3 | 6.8 | 8.1 | 4.8 | 6.7 |
| Walking Along Roadway | 5 | 4 | 3 | 6 | 2 | 20 |

| Crash Type | 2005 | 2006 | 2007 | 2008 | 2009 | Total |
|--|------|------|------|------|------|-------|
| With Traffic - From Front | 0.2 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 |
| Walking Along Roadway | 15 | 11 | 11 | 12 | 1 | 50 |
| Against Traffic - From Behind | 0.6 | 0.4 | 0.4 | 0.5 | 0 | 0.4 |
| Walking Along Roadway | 63 | 54 | 40 | 62 | 36 | 255 |
| Against Traffic - From Front | 2.6 | 2.2 | 1.6 | 2.5 | 1.5 | 2.1 |
| Walking Along Roadway - Direction / Position Unknown | 16 | 10 | 9 | 4 | 5 | 44 |
| | 0.7 | 0.4 | 0.4 | 0.2 | 0.2 | 0.4 |
| Motorist Entering Driveway or Alley | 18 | 3 | 10 | 5 | 7 | 43 |
| | 0.7 | 0.1 | 0.4 | 0.2 | 0.3 | 0.3 |
| Motorist Exiting Driveway or Alley | 40 | 26 | 27 | 28 | 37 | 158 |
| | 1.7 | 1 | 1.1 | 1.1 | 1.5 | 1.3 |
| Waiting to Cross - Vehicle Turning | 3 | 2 | 4 | 0 | 1 | 10 |
| | 0.1 | 0.1 | 0.2 | 0 | 0 | 0.1 |
| Waiting to Cross - Vehicle Not Turning | 3 | 3 | 1 | 2 | 2 | 11 |
| | 0.1 | 0.1 | 0 | 0.1 | 0.1 | 0.1 |
| Waiting to Cross - Vehicle Action Unknown | 1 | 0 | 1 | 0 | 0 | 2 |
| | 0 | 0 | 0 | 0 | 0 | 0 |
| Standing in Roadway | 54 | 43 | 40 | 42 | 42 | 221 |
| | 2.2 | 1.7 | 1.6 | 1.7 | 1.7 | 1.8 |
| Walking in Roadway | 44 | 74 | 81 | 2 | 163 | 364 |
| | 1.8 | 3 | 3.2 | 0.1 | 6.7 | 2.9 |
| Non-Intersection - Other / Unknown | 33 | 35 | 52 | 37 | 18 | 175 |
| | 1.4 | 1.4 | 2 | 1.5 | 0.7 | 1.4 |
| Intersection - Other / Unknown | 31 | 18 | 12 | 30 | 23 | 114 |
| | 1.3 | 0.7 | 0.5 | 1.2 | 0.9 | 0.9 |
| Multiple Threat | 20 | 22 | 20 | 44 | 24 | 130 |
| | 0.8 | 0.9 | 0.8 | 1.7 | 1 | 1 |
| Right Turn - Same Direction | 9 | n-a | n-a | n-a | n-a | 9 |
| | 0.4 | | | | | 0.1 |
| Right Turn - Opposite Direction | 7 | n-a | n-a | n-a | n-a | 7 |
| | 0.3 | | | | | 0.1 |
| Left Turn - Same Direction | 41 | n-a | n-a | n-a | n-a | 41 |
| | 1.7 | | | | | 0.3 |
| Left Turn - Opposite Direction | 52 | n-a | n-a | n-a | n-a | 52 |
| | 2.1 | | | | | 0.4 |
| Turn/Merge - Direction Unknown | 15 | n-a | n-a | n-a | n-a | 15 |
| | 0.6 | | | | | 0.1 |

| Crash Type | 2005 | 2006 | 2007 | 2008 | 2009 | Total |
|---|-------------------|------|------|------|------|-------|
| Trapped | 11 | 13 | 11 | 4 | 12 | 51 |
| | 0.5 | 0.5 | 0.4 | 0.2 | 0.5 | 0.4 |
| Dash | 199 | 189 | 208 | 166 | 126 | 888 |
| | 8.2 | 7.6 | 8.1 | 6.6 | 5.2 | 7.2 |
| Dart-Out | 57 | 49 | 46 | 25 | 29 | 206 |
| | 2.4 | 2 | 1.8 | 1 | 1.2 | 1.7 |
| Pedestrian Failed to Yield | 322 | 371 | 340 | 384 | 339 | 1756 |
| | 13.3 | 14.9 | 13.3 | 15.2 | 14 | 14.1 |
| Motorist Failed to Yield | 91 | 48 | 36 | 61 | 66 | 302 |
| | 3.8 | 1.9 | 1.4 | 2.4 | 2.7 | 2.4 |
| Motorist Left Turn - Parallel Paths | n-a | 86 | 132 | 110 | 107 | 435 |
| | | 3.5 | 5.2 | 4.4 | 4.4 | 3.5 |
| Motorist Left Turn - Perpendicular Paths | n-a | 7 | 4 | 4 | 4 | 19 |
| | | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 |
| Motorist Right Turn - Parallel Paths | n-a | 28 | 25 | 26 | 23 | 102 |
| | | 1.1 | 1 | 1 | 0.9 | 0.8 |
| Motorist Right Turn on Red - Parallel Paths | n-a | 3 | 7 | 2 | 2 | 14 |
| | | 0.1 | 0.3 | 0.1 | 0.1 | 0.1 |
| Motorist Right Turn on Red - Perpendicular Paths | n-a | 15 | 28 | 10 | 12 | 65 |
| | | 0.6 | 1.1 | 0.4 | 0.5 | 0.5 |
| Motorist Right Turn - Perpendicular Paths | n-a | 19 | 17 | 20 | 20 | 76 |
| | | 0.8 | 0.7 | 0.8 | 0.8 | 0.6 |
| Motorist Turn / Merge - Other / Unknown | n-a | 4 | 10 | 11 | 2 | 27 |
| | n-a | 0.2 | 0.4 | 0.4 | 0.1 | 0.2 |
| Off Roadway - Parking Lot | 217 | 239 | 203 | 204 | 228 | 1091 |
| | 9 | 9.6 | 7.9 | 8.1 | 9.4 | 8.8 |
| Off Roadway - Other / Unknown | 58 | 70 | 83 | 111 | 127 | 449 |
| | 2.4 | 2.8 | 3.2 | 4.4 | 5.2 | 3.6 |
| Other - Unknown Location | 5 | 9 | 6 | 11 | 2 | 33 |
| | 0.2 | 0.4 | 0.2 | 0.4 | 0.1 | 0.3 |
| Crossing an Expressway | 16 | 14 | 21 | 10 | 7 | 68 |
| | 0.7 | 0.6 | 0.8 | 0.4 | 0.3 | 0.5 |
| Total | 2421 | 2490 | 2560 | 2519 | 2429 | 12419 |
| | 19.5 ⁴ | 20 | 20.6 | 20.3 | 19.6 | 100 |

¹ PBCAT version 2 software was used starting in 2006. A few crash type definitions changed between versions 1 and 2.

Therefore some crash types were not applicable for 2005, while others were not applicable for 2006-2009.

² Row percent of column (yearly) total

³ Row percent of total

⁴ Column percent of row total

To aid in comprehension, Table 2 shows the most frequent individual crash types for all five years combined.

Table 2. Top 10 most frequent NC pedestrian crash types, 2005-2009.

| Rank | Crash Type | Total | Percent of NC Total |
|------------------------------|--|-------|---------------------|
| #1 | Pedestrian Failed to Yield | 1756 | 14.1% |
| #2 | Off Roadway - Parking Lot | 1091 | 8.8% |
| #3 | Dash | 888 | 7.2% |
| #4 | Backing Vehicle - Parking Lot | 861 | 6.9% |
| #5 | Walking Along Roadway With Traffic - From Behind | 834 | 6.7% |
| #6 | Vehicle-Vehicle / Object | 550 | 4.4% |
| #7 | Off Roadway - Other / Unknown | 449 | 3.6% |
| #8 | Motorist Left Turn - Parallel Paths | 435 | 3.5% |
| #9 | Dispute-Related | 417 | 3.4% |
| #10 | Walking in Roadway | 364 | 2.9% |
| Total for Top 10 Crash types | | 7645 | 61.6% |

These ten most frequent crash types encompass a mix of typical roadway crashes such as pedestrian failure to yield and pedestrian dashes, walking along and *in* the roadway crashes, motorists striking pedestrians while making left turns, and off-roadway and parking lot crashes including those with backing vehicles, dispute-related, and weird crashes such as those resulting from a prior vehicle-to-vehicle or vehicle striking object crash.

These top ten crash types accounted for nearly 62% of the pedestrian and motor vehicle crashes in North Carolina over these five years. The most frequent type, **Pedestrian Failed to Yield**, describes all instances where a pedestrian was attempting to cross the roadway and apparently failed to yield the right-of-way to a through (not turning) motorist, but did not clearly run into the street or dart-out from an obscured location. This crash type may include crashes where the pedestrian is trying to cross at a midblock, unmarked location and attempts to cross with an insufficient gap in traffic, crosses against a traffic signal at a controlled location, fails to detect an approaching motorist, or walks into a passing motor vehicle. Due to a frequent lack of detailed location information on police crash reports, the crash type should not be construed to imply fault, as it is often unclear whether an implied crosswalk existed or who had right-of-way. Additionally, there are many locations on roadways across the State, in rural areas, but also in many urban and suburban areas, with no clear crossings

for long intervals, so pedestrians must attempt to cross at uncontrolled locations between junctions.

The **Dash**, #3 in the list, also describes a crossing situation, but one where the pedestrian runs into the roadway and is struck by a vehicle whose view of the pedestrian was not obviously obstructed just prior to the crash. Dashes may also occur at both midblock and intersection locations.

A significant proportion of crashes involving pedestrians in the state occurred off the street and highway network. The second, fourth, and seventh most frequent crash types involving pedestrians occurred in **Off-Roadway** locations including **Parking Lots**, involved **Backing Vehicles in Parking Lots**, or occurred on other **Off-Roadway locations** such as public and private driveways, unpaved areas and others. These three crash types account for more than 19% of reported pedestrian crashes statewide. There are likely to be far more of these types of collisions that are not reported.

Walking Along Roadway With Traffic - From Behind (#5 in list), involves, not surprisingly, pedestrians walking along an edge or shoulder of a roadway with their backs to traffic - typically in locations lacking sidewalks. Situations in which the pedestrian is struck while walking along a roadway, but facing traffic, occur less frequently, and primarily involve the pedestrian being struck from the front (see Table 1).

Walking in the Roadway, #10 on the list, is somewhat different from above, in that it is not clear whether the pedestrian was walking along an edge, or crossing the roadway, or on any definite path, but appeared to be walking in the roadway in some fashion (not simply standing in the roadway) just prior to the collision.

Other frequently occurring crash types involve **Motorists** making **Left Turns** and striking **Parallel Path** pedestrians (#8 in list). Crashes involving turning motorists occur at both intersections and at driveways or other junctions where pedestrians may be struck while crossing the driveway or while crossing the roadway at such locations.

“Weird” crash types including **Vehicle-Vehicle or Vehicle-Object** and **Dispute-Related** were #6 and #9 in frequency. The first describes situations in which the pedestrian is struck as the result of a vehicle first striking another vehicle or an object. Dispute-related crashes are those in which a dispute or altercation between a driver and pedestrian resulted in a vehicle striking a pedestrian. These often occur during evening and night-time hours and more than half occurred at non-roadway locations such as parking lots and driveways. Apart from added lighting and security in parking lots and other public vehicular areas, these may be difficult crash types to address except with enforcement and other behavioral countermeasures.

Pedestrian Location

Almost half (46%) of all pedestrians involved in crashes in NC from 2005-2009 were struck at **Non-intersection** roadway locations - that is, at midblock locations or segments (Table 3). These segments may include features such as private driveways, bridges, or exit ramps. About one-fourth (23%) of all the pedestrian collisions occurred within an intersection including the crosswalk areas, or within 50 feet of an intersection (**Intersection** and **Intersection-related**). The “intersection-related” category was split from “intersection” beginning in 2006). Another 31% were struck in **Off-roadway** locations, most often parking lots or public or private driveways. In 2009, the percentage of off-roadway crashes was 33%.

If examining roadway-only crashes that occurred at known locations, the percentage at midblock locations was 66% with 34% occurring at intersections.

Table 3. NC pedestrian crashes by location type.

| Crash Location | 2005 | 2006 | 2007 | 2008 | 2009 | Total |
|-----------------------------|-------------------|------|------|------|------|-------|
| Intersection | 553 | 356 | 401 | 352 | 341 | 2003 |
| | 22.8 ¹ | 14.3 | 15.7 | 14 | 14 | 16.1 |
| Intersection-related | 0 ² | 252 | 197 | 211 | 225 | 885 |
| | 0 | 10.1 | 7.7 | 8.4 | 9.3 | 7.1 |
| Non-Intersection | 1097 | 1129 | 1208 | 1171 | 1052 | 5657 |
| | 45.3 | 45.3 | 47.2 | 46.5 | 43.3 | 45.6 |
| Off-Roadway | 758 | 738 | 746 | 772 | 809 | 3823 |
| | 31.3 | 29.6 | 29.1 | 30.6 | 33.3 | 30.8 |
| Unknown | 13 | 15 | 8 | 13 | 2 | 51 |
| | 0.5 | 0.6 | 0.3 | 0.5 | 0.1 | 0.4 |
| Total | 2421 | 2490 | 2560 | 2519 | 2429 | 12419 |
| | 19.5 ³ | 20 | 20.6 | 20.3 | 19.6 | 100 |

¹ Row percent of column total

² Intersection-related definition did not exist for 2005 data

³ Column percent of row total

Figure 1 shows how the proportion of location types vary from rural to urban crash locations in NC, and may also vary from city to city, depending on how closely-spaced intersections are, and other factors. Non-intersection crash locations make up an even higher percentage, 65% of the total pedestrian crashes in rural areas compared with 37% in urban areas, while non-roadway (parking lot crashes) are an even lower percentage in rural areas.

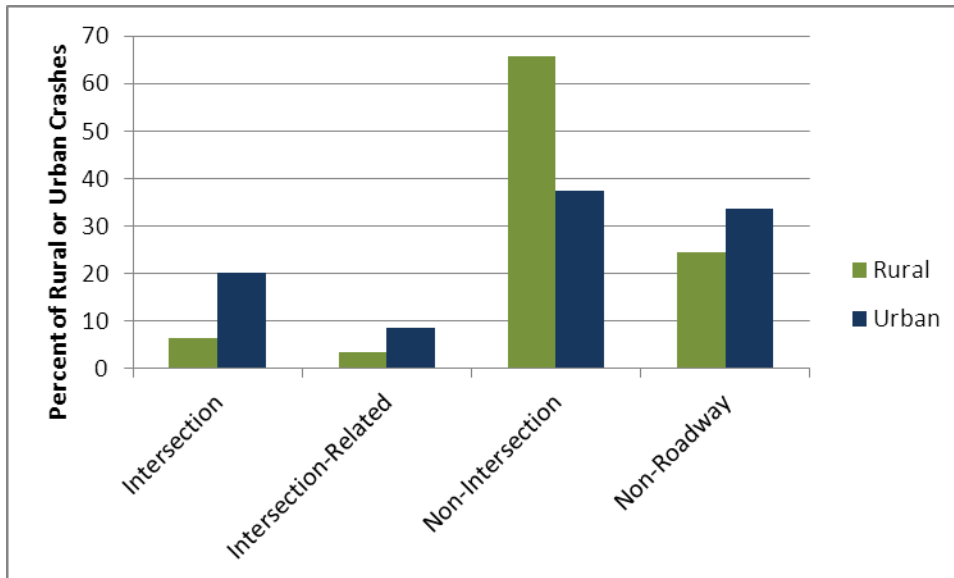


Figure 1. NC rural and urban crash percentages by location type, 2005-2009.

In addition to greater numbers of crashes, the fatality rate is much higher for pedestrians struck along road sections (non-intersection locations) compared with intersections. Fatal crashes were 11.5% of the total or 2.8 times higher than for crashes at intersection locations. The 650 fatal crashes at non-intersection locations represent 78% of all NC pedestrian fatal crashes, with 16% of fatal crashes occurring at intersection and intersection-related locations and 6% at non-roadway locations (Figure 2). In part these findings reflect pedestrians being struck at a higher rate at non-intersection locations in rural areas, where speeds are typically higher, roadways are often not lighted, and other factors.

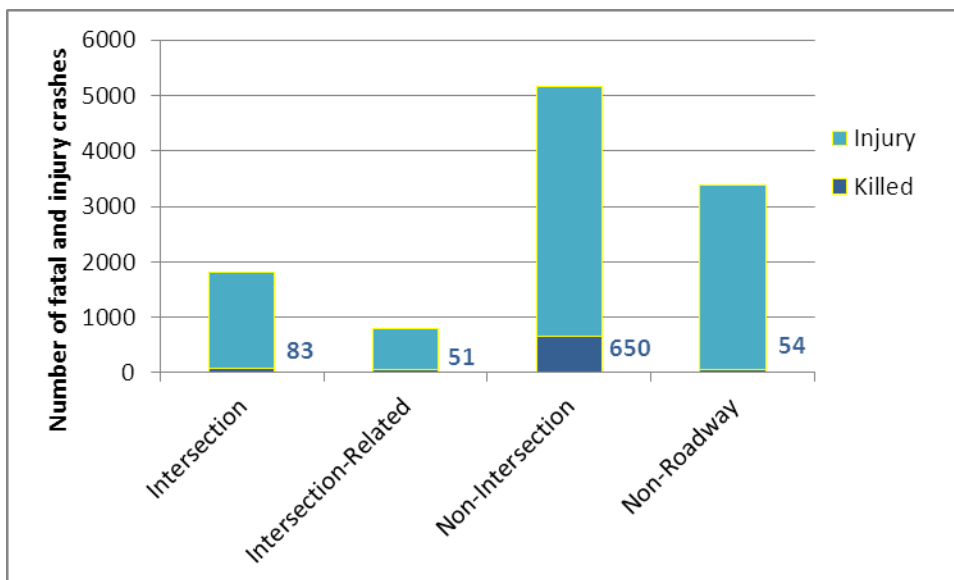


Figure 2. NC killed and injured pedestrians by location type, 2005-2009.

Pedestrian Position

Table 4 describes, for years 2007 through 2009, the pedestrian's position at the time of the crash (data not coded prior to 2007). Over these three years 47% of pedestrians were standing in, walking in, or crossing, the street and were in a regular traffic lane at the time they were struck. Another 25% were in parking lots or other non-roadway areas besides driveways or alleys, and 8% were crossing the street in a crosswalk (marked or implied) as best determined from diagrams and other information on the crash report forms. Smaller percentages of pedestrians struck were on driveways or alleys (5%); walking along the street on paved shoulders, bike lanes, or parking lanes (5%); on sidewalks or driveway crossings (3%); within the intersection proper (not in the crosswalk area – 2%); or on unpaved areas alongside roadways (1%).

Table 4. Pedestrian position prior to the crash (not coded prior to 2007).

| Pedestrian Position | 2007 | 2008 | 2009 | 3-yr Total |
|--|-------------------|------|------|------------|
| Intersection Proper | 47 | 54 | 69 | 170 |
| | 1.8 ¹ | 2.1 | 2.8 | 2.3 |
| Crosswalk Area | 228 | 184 | 170 | 582 |
| | 8.9 | 7.3 | 7 | 7.8 |
| Travel Lane | 1242 | 1216 | 1098 | 3556 |
| | 48.5 | 48.3 | 45.2 | 47.4 |
| Paved Shoulder / Bike Lane / Parking Lane | 97 | 122 | 173 | 392 |
| | 3.8 | 4.8 | 7.1 | 5.2 |
| Sidewalk / Shared Use Path / Driveway Crossing | 74 | 58 | 56 | 188 |
| | 2.9 | 2.3 | 2.3 | 2.5 |
| Unpaved Right-of- Way | 42 | 19 | 22 | 83 |
| | 1.6 | 0.8 | 0.9 | 1.1 |
| Driveway / Alley | 99 | 155 | 108 | 362 |
| | 3.9 | 6.2 | 4.4 | 4.8 |
| Non-Roadway - Parking Lot / Other | 639 | 575 | 695 | 1909 |
| | 25 | 22.8 | 28.6 | 25.4 |
| Other / Unknown | 92 | 136 | 38 | 266 |
| | 3.6 | 5.4 | 1.6 | 3.5 |
| Total - 3 years | 2560 | 2519 | 2429 | 7508 |
| | 20.6 ² | 20.3 | 19.6 | |

¹ Row percent of column total

² Column percent of row total

Grouped Crash Types

For ease in understanding and looking at associated factors, the 60 individual crash types from Table 1 have been grouped into 16 crash type groups (Table 5). For example, all **Backing vehicle** crash types have been grouped into a single category. Other similar types of crashes have been grouped as well. These combined crash type groups also show some variability by year, but less than individual crash types. Examining the totals across all years, crash type groups are shown in rank order of frequency.

Table 5. NC pedestrian crash type groups, 2005-2009.

| Rank | Grouped Pedestrian Crash Type | Total | Percent of NC Total |
|------|---|-------|---------------------|
| #1 | Unusual Circumstances | 2511 | 20.2% |
| #2 | Crossing Roadway - Vehicle Not Turning | 2058 | 16.6% |
| #3 | Off Roadway | 1540 | 12.4% |
| #4 | Backing Vehicle | 1307 | 10.5% |
| #5 | Walking Along Roadway | 1203 | 9.7% |
| #6 | Dash / Dart-Out | 1094 | 8.8% |
| #7 | Crossing Roadway - Vehicle Turning | 862 | 6.9% |
| #8 | Pedestrian in Roadway - Circumstances Unknown | 676 | 5.4% |
| #9 | Other / Unknown - Insufficient Details | 322 | 2.6% |
| #10 | Crossing Driveway or Alley | 201 | 1.6% |
| #11 | Multiple Threat / Trapped | 181 | 1.5% |
| #12 | Working or Playing in Roadway | 152 | 1.2% |
| #13 | Bus-Related | 127 | 1.0% |
| #14 | Unique Midblock | 94 | 0.8% |
| #15 | Crossing Expressway | 68 | 0.5% |
| #16 | Waiting to Cross | 23 | 0.2% |
| | Total | 12419 | 100.0% |

Within groups of crash types, the combined **Unusual Circumstances** types together comprise one-fifth of all pedestrian crashes. A few of the specific crash types comprising this group include collisions that involve vehicles striking other vehicles or objects before a pedestrian was struck, Dispute-Related, and Pedestrian on Vehicle. Other circumstances making up this group include Assault with Vehicle, crashes involving driverless vehicles, emergency vehicles, and those involving pedestrians standing or walking near disabled vehicles or those that were involved in prior crashes. Many of these unusual collision types can be difficult to address with specific engineering types of *countermeasures*, but may be amenable to improved lighting and security in parking areas (dispute and assault-related),

educating persons on safe behaviors following a crash or vehicle issues, and enforcement and educational countermeasures aimed at reducing speeds and improving other behaviors.

The second most frequent group, **Crossing Roadway – vehicle not turning**, is comprised of all situations in which a pedestrian is crossing the roadway (but not running or darting-out) and is struck by a through motorist. Either participant could have failed to yield the right-of-way, but other factors may also be involved. About 60% of these crossing roadway collisions occurred at non-intersection (midblock) locations with about 40% at or related to an intersection.

The **Dash / Dart-Out group** (#6 in rank) also includes crashes in which the pedestrian is struck by a through motor vehicle, but involves situations in which the pedestrian runs into the roadway (dash) or walks or runs into the roadway and is struck by a vehicle whose view of the pedestrian is blocked until an instant before the crash (pedestrian dart-out). An even high percentage, 68%, of these types of collisions occurred away from intersections. Children are also highly over-represented in dashes and dart-outs. Potential *countermeasures* for these two groups of crashes may be found in [PEDSAFE](#), an online countermeasure selection tool compatible with PBCAT (Harkey and Zegeer, 2004).

Crossing Roadway - Vehicle Turning (#7) accounted for 7% of pedestrian crashes. All sorts of vehicle turning situations are covered in the **Turning Vehicle** category, including right and left turns at both intersections and driveways when the pedestrian and the vehicle are traveling in either the same or opposite directions or are originally on crossing paths. A majority of pedestrians were crossing at an intersection (79%) when struck, while 9% were crossing near an intersection, and 11% at a mid-block area. *Countermeasures* for this group of crashes may also be found in PEDSAFE and include treatments for intersections and for driveways, depending on the locations of occurrence/need.

Off-roadway crashes, the third most frequent crash group, accounted for 12% of pedestrian crashes statewide. A majority of these crashes (82%) occur in parking lots, but this crash group also includes reported crashes that occur in a variety of off-roadway locations such as driveways. **Backing vehicle**, the fourth most common group of crashes, involve a backing vehicle striking a pedestrian, regardless of the location of the event (parking lot, driveway, roadway, etc.). As mentioned previously, a majority of backing vehicle crashes do, however, also occur in parking lots or driveways. Countermeasures for backing vehicle and off-roadway crashes could include improved parking area and driveway design, as well as better training of drivers and perhaps greater use of new in-vehicle technologies and warning-devices. In addition caregivers need to ensure that young children, who are especially vulnerable to both parking lot and backing crashes, are monitored at all times when near cars or traffic areas.

Walking along roadway crashes (#5 on the list), account for another 10% of pedestrian collisions in NC, and as mentioned previously, most often involve pedestrians struck from the rear while walking in the same direction as traffic, but can also involve pedestrians walking against traffic and being struck from the front, or other walking along roadway situations. These kinds of collisions usually occur where sidewalks (or other space for pedestrians to walk) are lacking, and often at night when visibility is poor. Nearly 58% of

these collisions involved pedestrians walking in a traffic lane; 21% involved pedestrians walking along a paved or unpaved shoulder, or on a driveway or alley crossing, while the rest were at unknown positions. Countermeasures include providing sidewalks or, in rural areas, paved shoulders or paths where pedestrians can walk. Education includes teaching children and adults to use conspicuity aids (lights and reflective gear) at night, and generally, to walk facing traffic in locations that lack sidewalks or off-road paths and move off the roadway as needed. There may, however, be obstacles to crossing the roadway (and an increase in “crossing” exposure) in order for pedestrians to always walk facing traffic in locations that lack sidewalks or off-road paths.

The 8th and 9th most frequent groups include **pedestrians** who were **in the roadway**, but other details are lacking, or even less was known about the location and circumstances leading up to the crash. Unless the causes and locations are known, specific countermeasures may be difficult to identify.

Another highly represented group of crashes include **Pedestrians** struck while **Crossing a Driveway or Alley** (#10). This crash type is similar to the Turning Vehicle group, but involves drivers turning in and out of driveways and across the path of pedestrians.

Multiple Threat (#11) accounted for around 180 pedestrian collisions over this period. Forty-four percent of these occurred at intersection locations with another 14% related to an intersection, and 41% at midblock locations. Countermeasures that can reduce the risk of multiple threat collisions include advance stop bars before intersections and midblock crossings; locating bus stops on the far side of intersections; and providing controlled crossings for multi-lane roadways.

The remaining crash groups together account for less than 4% of all the pedestrian crashes. Again, more information on potential countermeasures for the above types of crashes may be reviewed in the interactive Web site and document, PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System ([PEDSAFE](#)), and in extensive other information and links to additional resources contained on the Pedestrian and Bicycle Information clearinghouse sites ([PBIC](#)) developed for the U.S Department of Transportation, Federal Highway Administration. In order to develop countermeasures for particular locations, crash data specific to those locations would need to be examined. A comprehensive evaluation through on-site safety audits and engineering evaluations would also be needed.

Age Group and Crash Group Involvement

Examination by age group of the pedestrian reveals variation in the extent to which different ages are involved in these crash type groups (detailed data not shown, but some results are summarized below). As might be expected, adults and children tend to be more involved in different types of crashes, often at different types of locations. Among the more predominant crash types, age-related trends are as follows:

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- **Backing vehicle** – Young children, those under age 5, are over-represented in this category, which accounts for about 22% of all under age 5 reported crashes, but about 11% over all ages. Older adults, ages 60 and up, are also over-represented, with 20 - 22% of their crashes being these types.
 - **Off Roadway** – Young children and older adults (especially the 60 – 69 year age group) are also the most over-represented in Off Roadway crashes in general, including crashes in driveways and parking lots (when the vehicle is not backing). This group accounts for 17% of under age 5 crashes and 21% of aged 60 to 69 year old crashes, compared with about 12% of crashes overall.
 - **Pedestrian Dart-out or Dash** – Children under 15 are highly over-represented in this crash type which accounts for about 33% of their crashes compared with about 9% over all ages.
 - **Crossing Roadway – Vehicle Turning** – Older adults are also somewhat over-represented in this crash type, most probably because older adults more often cross in crosswalks at intersections than other ages.
 - **Unusual circumstances** – Adults of all ages, but particularly those from 20 to about 39 are most involved in this group of crashes which includes such circumstances as assault with vehicle, dispute-related crashes, pedestrians on or clinging to a vehicle that began moving, the results of vehicle striking vehicle or vehicle striking object crashes, and vehicles leaving the road and striking pedestrians on a sidewalk or off-road area, as well as collisions involving emergency vehicles, vehicles without drivers and others.

Injury Severity and Crash Group

Some types of crashes have also resulted in fatal and serious injuries more frequently than others.

- Although accounting for only 0.6% of crashes, crashes involving pedestrians **Crossing Expressways** resulted in 7.6% of the fatalities with 81% of those struck in such crashes dying as a result of their injuries.
- **Unique Midblock** (for example, crossing to or from a mailbox) also resulted in a high rate of fatalities (1.9 times the average over this five year period).
- **Walking Along the Roadway** fatalities were 1.5 times the average rate for all crash types. Both of these latter types may occur on higher-speed rural roadways lacking sidewalks and enhanced roadway illumination.
- Pedestrians are also 1.8 times more likely to suffer fatal or serious injuries when **Crossing Roadways** and struck by vehicles going straight ahead (11% of those struck or 1.8 times the average). The largest portion (30%) of fatalities resulted from this type.
- Another group that results in a higher proportion of fatalities are those involving pedestrians in the roadway under unknown circumstances. The time of day, the speed of the roadway (such as high-speed Expressways), pedestrian age and impairments, and other factors associated with the crash types may all play a role in the severity of injuries.

See the **Pedestrian Crash Facts** summary report for more information on pedestrian crash characteristics and associated environmental and roadway crash factors.

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